CJLT RCAT
Canadian Journal of Learning and Technology
La Revue canadienne de l'apprentissage et de la technologie

Volume 48 (4) Special Issue 2022

Analysis of the Status and Influencing Factors of Online Learning

Analyse de l'état et des facteurs d'influence de l'apprentissage en ligne

Jiaju He, *Faculty of Education, Beijing Normal University, China*
Hong Zhao, *Faculty of Education, Beijing Normal University, China*
Fei Jiang, *Faculty of Education, Beijing Normal University, China*

Abstract

During the COVID-19 prevention and control period, large-scale online education was the largest digital transformation practice in education in human history. This study launched a questionnaire survey on primary and high school students. The survey was conducted from four aspects: demographics, online learning preparation, the online learning situations, and online learning experience. This study thoroughly investigated the status and problems of students' online learning and analysed the characteristics of students' online learning and the differences amongst grades. The study found that students have high adaptability and continuance intention to online learning.

This study found that students also had some learning difficulties in the process of online learning, mainly manifested by lack of interaction, difficulty in concentration, and lack of learning initiative. There were significant differences among different grades. The overall situation of junior high school students' online learning is better than that of primary school students and senior high school students.

Keywords: Primary and high school; Online learning; Suspension of school without suspending learning; Influencing factors

Résumé

Pendant la période de prévention et de contrôle du COVID-19, l'enseignement en ligne à grande échelle a été la plus grande pratique d'informatisation de l'éducation de l'histoire humaine. Cette étude a lancé une enquête par questionnaire sur les élèves du primaire et du secondaire. L'enquête a été menée sous quatre aspects : démographie, préparation à l'apprentissage en ligne, contexte de l'apprentissage en ligne et expérience de l'apprentissage en ligne. Cette étude a examiné de manière approfondie le statut

et les problèmes de l'apprentissage en ligne des étudiants et a analysé les caractéristiques de l'apprentissage en ligne des étudiants et les différences entre les classes. L'étude a révélé que les étudiants ont une grande capacité d'adaptation et une intention de poursuivre l'apprentissage en ligne.

Les étudiants ont également quelques difficultés d'apprentissage dans le processus d'apprentissage en ligne, qui se manifestent principalement par un manque d'interaction, des difficultés de concentration et un manque d'initiative en termes d'apprentissage. Il existe des différences significatives entre les différentes classes. La situation générale de l'apprentissage en ligne des élèves du premier cycle du secondaire est meilleure que celle des élèves du primaire et du deuxième cycle du secondaire.

Mots clés : École primaire et secondaire ; apprentissage en ligne ; suspension de l'école sans suspension de l'apprentissage ; facteurs d'influence

Introduction

During the COVID-19 epidemic prevention and control period, online education became the main mode of education in China. Online education is flexible and can cross the constraints of time and space, but it also has the limitation of separating the teaching and learning process. If not appropriately designed, organized, and implemented, it can easily have a negative impact on the effectiveness of students' online learning due to inadequate teacher supervision, insufficient parental supervision, and students' weak self-control. J. X. Wang et al. (2020) conducted a large-scale survey in Xiaogan City in the Hubei Province and found some potential factors affecting the development of online education, including the concept of online education, security and supply, teacher and students' literacy and competence, the quality of ICT in education, and more. D.D. Wang et al. (2020) carried out a nationwide online questionnaire survey inquiring into the attitudes of different subjects towards online education. They found that educational administrators had an encouraging and supportive attitude, school administrators were relatively positive, teachers had a positive attitude but a sense of anxiety, students' attitudes differed significantly between different areas and grades, and parents had high expectations alongside high concerns.

Indeed, in the face of the largest scale of digital transformation practice in education in human history, not only the serviceability of platforms and resources are facing challenges, but teachers' teaching abilities and students' online learning abilities are also facing a big challenge. How to effectively organize online education is a big problem. Therefore, this study investigated K12 students in China to learn about their online learning situations and experience and tried to analyze the characteristics and problems of K-12 students' online learning, in order to reveal the problems in practice and provide some suggestions for the reform of China's education informatization.

Research Methodology

This study adopted the questionnaire survey method. The questionnaire consisted of four main

sections: demographic characteristics, online learning preparation, online learning situations, and online learning experience. Online learning preparation mainly refers to the psychological and environmental preparation, including previous experience, motivation, and network conditions. Online learning situations mainly refer to the implementation of courses and the performance of students in and after class, including the situation of the online classes, self-regulated learning, and students' preferences. Online learning experience mainly refers to the feelings and perceptions of students in many aspects of online learning, including students' adaptability, recognition, difficulties, and continuance intention in online learning.

In this study, questionnaires were distributed online, and the survey was conducted from March 19 to April 19, 2020. A total of 60,567 questionnaires were collected of which 56,438 valid questionnaires were finally obtained, with an effective response rate of 93.18%. The Cronbach Alpha was used to test the reliability of the questionnaire. The coefficients of the three dimensions of online learning preparation, online learning situations, and online learning experience and the overall questionnaire were 0.943, 0.911, 0.922, and 0.920, respectively. Meanwhile, KMO and Bartlett's Test were used to test the validity. The KMO value was 0.956, which was above 0.7, and the p-value of the Bartlett test was less than 0.01. As such, this questionnaire has good reliability and validity.

The questionnaire sample covered 34 provinces in China. The proportion of male students was 53.37%, while female students accounted for 46.63%. The number of primary school students was the highest (47.02%), followed by junior high school students (36.83%), and the smallest number were senior high school students (16.15%). The biggest number of students came from urban areas (60.06%), while 13.80% and 15.76% came from counties and townships, and the number of rural students was the least (10.39%).

Results

Online Learning Preparation

Online Learning Previous Experience

Before COVID-19, 41.66% of students overall had online learning experience. The largest group was senior high school students, with a proportion of 45.77%. The second was junior high school students, where the proportion was 42.30%. The last was primary school students, where the proportion was 39.75%. One-to-many online live classes were the main learning type, and school subjects were the main online learning content.

Online Learning Motivation

This study investigated the motivation from two aspects: external motivations (including school requirements and parental demands) and internal motivations (including students' personal interests and needs). This item was multiple choice. From Table 1, students were mainly motivated by their personal needs, followed by requests from parents and school requirements, and finally by their

personal interests. The differences between grades were that primary school students were mainly driven by parental requests, while high school students were primarily motivated by personal needs.

Table 1

Online Learning Motivation

Grade	External motivation		Internal motivation	
	School requirement	Parental demand	Personal interest	Personal need
Primary school	33.83%	46.58%	28.87%	43.59%
Junior high school	41.44%	43.16%	26.50%	50.32%
Senior high school	48.99%	27.36%	20.30%	52.01%

Network Condition

The results show that the network environment was generally good. 66.65% of the participants said they had good Internet connections and 33.35% of participants reported network problems, such as network latency and disconnection.

Online Learning Situations of Students

This part surveyed three aspects: live online class performance, self-regulated learning, and online learning preferences.

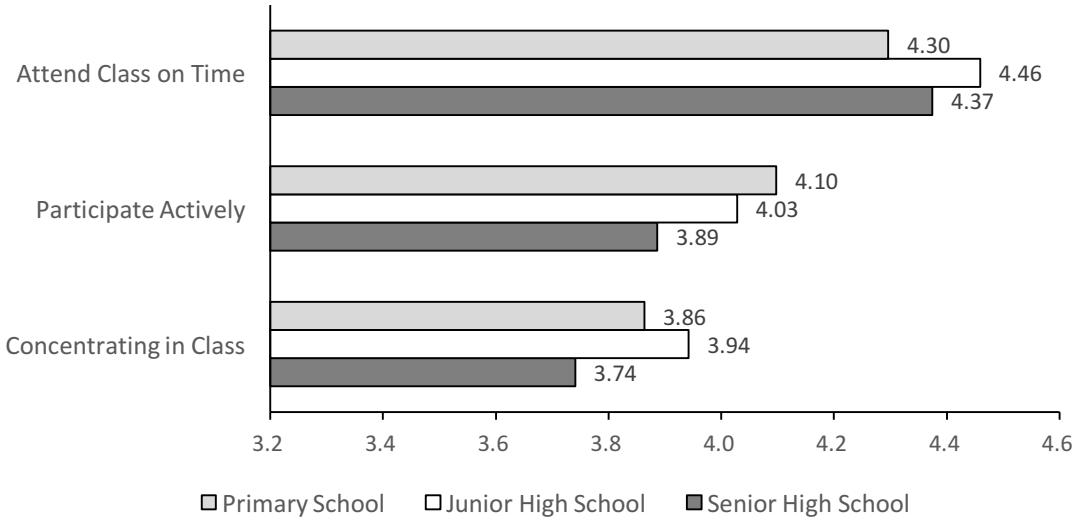
Live Online Class Performance

The average length of online classes for primary and high school students was over 3 hours per day and showed an increasing trend by grade level. This research used a five-point scale for participants to rate themselves on three dimensions: attending the live online class on time, participating actively in class activities, and concentrating in class (Figure 1).

Overall, students' self-perception of their online learning performance was good, with scores close to 4 on all dimensions. Attending class on time scored over 4 points, followed by participating actively in activities. In comparison, students perceived themselves to be weaker in terms of concentrating in class. There were differences in different grades. Junior high school students were generally better at online learning performance than in other grades; primary school students were the most active in class activities; and senior high school students were the worst of the three levels in all dimensions except for attending class on time.

Figure 1

Online Class Situation



Self-regulated Learning

As previous research mentioned, self-regulated learning ability is a key factor to online learning. A five-point scale was conducted in this part from five aspects: learning plan, finishing the homework on time, interaction with the teacher and students, self-management, and self-evaluation (Figure 2). Overall, students scored 3–4 points on each dimension, indicating that their self-regulated learning was at an intermediate level. The highest was the dimension of completing homework on time, with a score of over 4, followed by self-management of learning. While active communication and self-evaluation scored similarly, the score of making a learning plan was the lowest. In terms of different grades, junior high school students' self-regulated learning performance was generally better than other grades. On the contrary, primary school students' performance in all dimensions was the worst, especially in the dimension of self-management, which had a large gap from other grade students.

Learning support is important for students' self-regulated learning. Table 2 shows the main learning supports were from themselves, teachers, and parents. To be specific, primary school students ranked their parents as the most supportive of their learning, followed by teachers, and then themselves, while junior and senior high school students considered themselves first, then their teachers, and finally their parents.

Figure 2

Self-regulated Learning Situation

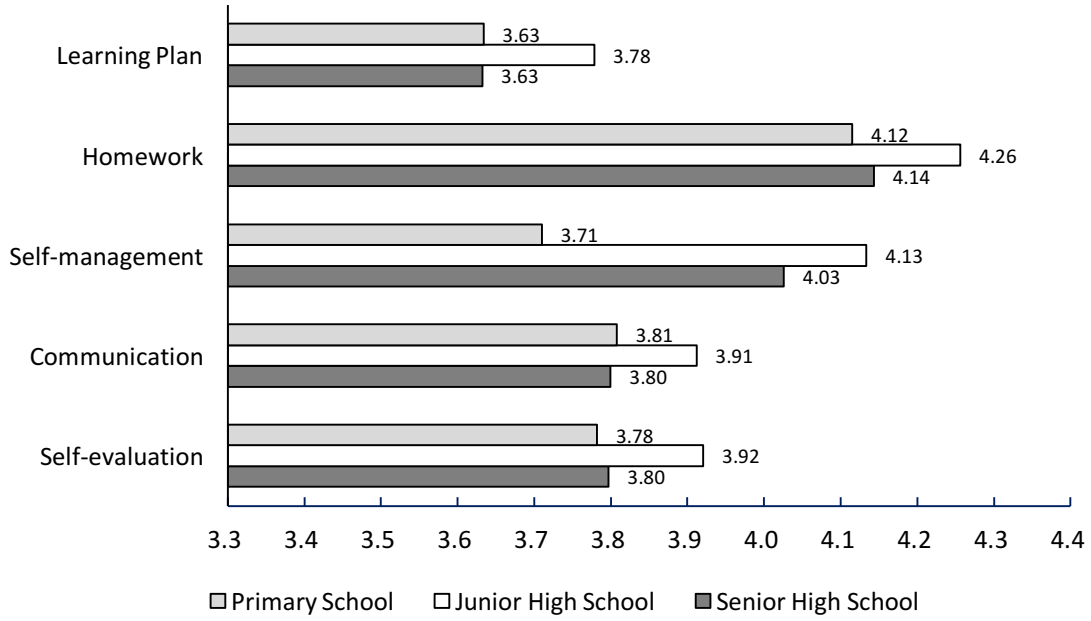


Table 2

Learning Support Situation

Scale	Primary school	Junior high school	Senior high school
Oneself	4.211	4.873	5.358
Teacher	4.737	4.621	4.374
Parent	5.062	3.818	3.064
Fellow student	0.335	1.138	1.436
School	0.527	0.455	0.648
Education administration	0.128	0.096	0.120

Online Learning Preference

This survey investigated primary and high school students' online learning preferences in terms of platforms, resources, course types, and content (Table 3). The result showed that students were most concerned with course content, followed by teachers' guidance, faculty, and learning resources. The last

was communication with classmates and platform functions. To clarify the online learning preferences, we asked the participants to rank the options they chose for each dimension (Table 4).

Table 3

Online Learning Concerns

Dimension	Overall	Primary school	Junior high school	Senior high school
Course content	5.53	5.41	5.61	5.68
Teachers' guidance	4.65	4.94	4.56	4.00
Faculty	3.96	3.55	4.01	5.03
Learning resource	3.50	3.16	3.85	3.72
Communication with classmate	2.41	2.13	2.82	2.30
Platform function	2.26	2.09	2.49	2.24

Online Learning Platform Functions. Students mainly focused on the four basic functions of the platforms, including taking notes, assignment submission, in-class communication, and after-class communication. In addition, both primary and junior high school students preferred the function of raising their hands, while senior high school students preferred the function of video playback.

Types of Online Learning Resources. Students' preferences were similar. Textual materials were the favorite resources for all students, followed by course videos, then audio materials, animations, and pictures. The last was educational games.

Online Learning Course Type. All students preferred the three types of one-to-many live classes, online tutoring, and micro-lessons, accounting for 58.32%, 51.94%, and 39.72%, respectively. From the perspective of different grades, primary school students favored online tutoring from teachers, while high school students preferred one-to-many live classes.

Online Learning Course Content. The percentage of students wanting to participate in school subject courses was higher than that of ability training courses. With the rise of grade level, the number of students attending school subject courses increased respectively.

Table 4

Online Learning Preferences

Dimension	Overall	Primary school	Junior high school	Senior high school
Platform function				
Taking note	6.44	5.24	7.59	7.28
Assignment submission	5.96	5.99	6.16	5.39
In-class communication	5.46	5.19	5.79	5.48
After-class communication	4.98	4.90	5.23	4.65
Video playback	4.57	4.21	4.57	5.65
Raise hand (answer question)	3.96	4.19	4.09	3.01
Resource type				
Textual material	4.35	4.04	4.59	4.73
Video	3.86	3.96	3.80	3.75
Audio material	2.99	3.08	2.92	2.89
Animation	2.46	2.62	2.41	2.14
Picture	2.40	2.10	2.57	2.93
Educational game	1.88	2.02	1.90	1.42
Course type				
One-to-more live class	58.32%	51.32%	66.49%	60.10%
Online tutoring	51.94%	52.49%	54.81%	43.78%
Micro-lecture	39.72%	41.02%	38.13%	39.57%
Recorded web courses	28.48%	31.16%	23.22%	32.67%
One-to-one live class	27.18%	32.89%	22.44%	21.38%
Self-learning based on resources	14.22%	12.69%	15.06%	16.73%
Course content				
School subject	80.18%	73.43%	85.95%	87.61%
Ability training	62.05%	69.61%	56.50%	51.37%

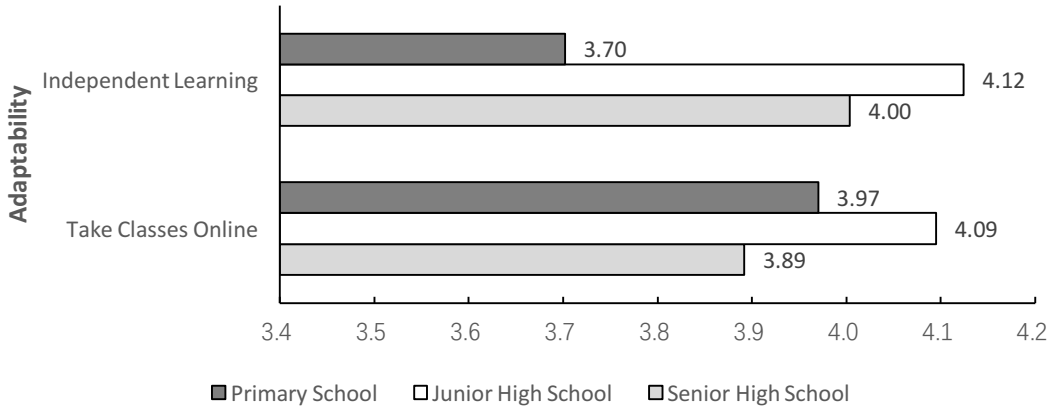
Online Learning Experience of Students

Online Learning Adaptability

In this part, a 5-point scale was conducted to measure the adaptability, which included two dimensions: adaptation to online classes and adaptation to self-regulated learning (Figure 3). The results revealed that the overall adaptability of students to online learning was good, with all scores around 4. In terms of different grades, junior high school students had the highest score. While senior high school students had better adaptability than primary school students in the aspect of self-regulated learning, the adaptability to online classes was just the opposite.

Figure 3

Online Learning Adaptability



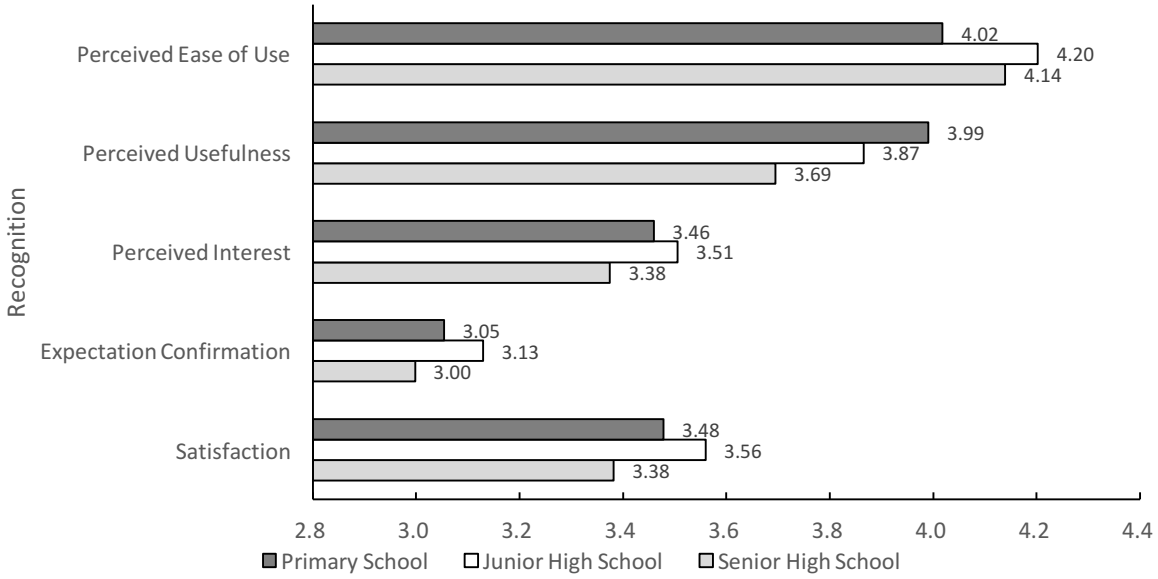
Online Learning Recognition

In this part, students' recognition of online learning includes five dimensions: perceived ease of use, perceived usefulness, perceived interest, expectation confirmation, and satisfaction. Perceived ease of use refers to the students' perceptions of how easy it is to use an online learning platform; perceived usefulness is the degree to which students believe, subjectively and objectively, that online learning is effective; perceived interest refers to students' interest in online learning; expectation confirmation refers to reaching students' expectations of online learning achievement during actual learning; and satisfaction refers to students' perceptions of their self-experiences and overall recognition of online learning after participating. The survey was still conducted on a five-point scale (Figure 4).

The results suggest that there was a big difference among the five dimensions. The highest were the perceived ease of use and perceived usefulness. The second were intermediate on satisfaction and perceived interest, and the lowest was expectation confirmation. This result indicated that students felt that there was a gap between the effect of online learning and their expectations. There were also differences in different grades. Junior high school students had better recognition than primary school students or senior high school students.

Figure 4

Online Learning Recognition



Online Learning Difficulties

In this study, students were asked to rank the online learning difficulties they encountered (Table 5). The difficulties centred around the lack of communication, the difficulty of concentrating on classes, and the lack of initiative in learning. And in terms of preparation for learning, there were mostly issues with the network and the learning environment. The variances in the difficulties faced by the students were small with regard to the different grades, but there were differences in the greatest difficulties. The biggest learning difficulty for primary and junior high school students was the lack of communication, and for senior high school students, it was the difficulty of concentrating.

Table 5

Online Learning Difficulties

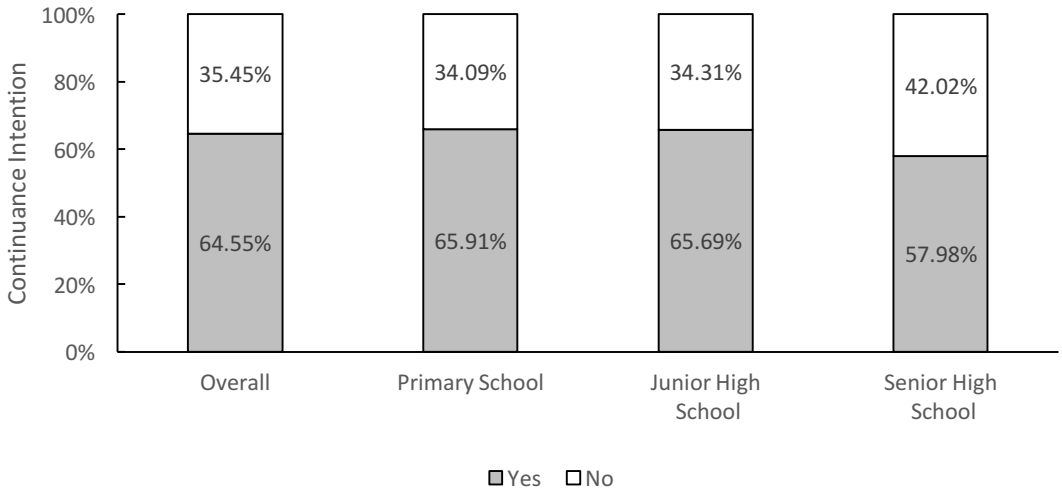
Dimension	Primary school	Junior high school	Senior high school
Lack of communication	5.54	4.73	4.58
Concentration	4.30	4.13	5.22
Network	3.12	4.34	4.04
Lack of initiative in learning	2.96	1.33	1.50
Noisy environment	1.72	2.28	2.47

Continuance Intention to Online Learning

As shown in Figure 5, 64.55% of students were willing to continue to participate in online learning after COVID-19. However, the number of students wanting to continue learning online tended to decrease as the grade rose. It was found that students were willing to continue to participate in online learning for three main reasons: the convenience of online learning, the opportunity to learn content that they were interested in, and the possibility to improve scores. The major reasons for their reluctance to continue the online learning were the lack of communication with teachers, lack of self-regulated learning abilities, and uninterested in online courses. In addition, a small number of students stressed technical problems with the network and equipment, as well as the damage to their eyes caused by electronics, as reasons for their unwillingness.

Figure 5

Online Learning Continuance Intention



To further investigate the factors affecting students' continuance intention, this research specified independent variables: demographic characteristics, online learning experience, online learning environment, online learning situations, self-regulated learning, online learning adaptability, perceived ease of use, perceived usefulness, perceived interest, expectation confirmation, satisfaction, and online learning difficulties (Table 6). The dependent variable was continuance intention to online learning. The coefficient of determination (R^2) of the regression model was 0.154, indicating that these variables together explain 15.4% of the variance. Demographic characteristics, device and network affordances, and online learning experience all had a positive effect on continuance intention, whereas learning difficulties had a negative influence.

In terms of demographic characteristics, gender, school grade, ethnicity, location, and learning experience all had significant effects on students' continuance intention to online learning. Students with a male gender, senior grade, Han nationality, in urban areas, and with online learning experience had higher intentions and a better online learning experience. Both devices and network affordances

had a significant impact on continuance intention. In particular, students who used a computer or tablet and had better Internet access were more likely to continue learning online. In terms of the learning situation, the better the student's online learning situation and experience, the higher the student's willingness to stay engaged. Specifically, students who were more adaptable to learning, had a stronger interest in learning, and had higher confirmation expectations and satisfaction, were more inclined to continue online learning. In terms of learning difficulties, there was a negative correlation between learning difficulties and the intention of continuing online learning. Students who encountered four barriers (lack of equipment, poor Internet access, lack of interest, and difficulty in concentrating) were less likely to continue to participate.

Table 6

Analysis of Factors Influencing Online Learning Continuance Intention

Variable	*B*	*SE*	β	*t*	*p*
Constant	1.852	0.022		83.277	0.000
Personal background					
Gender	-0.049	0.004	-0.051	-13.011	0.000
Grade	0.03	0.003	0.046	9.295	0.000
Ethnicity	-0.015	0.006	-0.009	-2.316	0.021
Location	-0.007	0.002	-0.014	-3.568	0.000
Learning preparation					
Previous experience	0.113	0.004	0.117	29.671	0.000
Device type	0.017	0.005	0.017	3.596	0.000
Network condition	0.032	0.004	0.031	7.821	0.000
Learning situation					
Punctuality	0.018	0.003	0.028	5.203	0.000
Activity	0.01	0.004	0.017	2.766	0.006
Concentration	0.015	0.004	0.028	4.103	0.000
Homework	0.017	0.004	0.028	4.407	0.000

Variable	*B*	*SE*	β	*t*	*p*
Learning experience					
Perceived ease of use	0.008	0.003	0.014	2.452	0.014
Perceived usefulness	0.015	0.003	0.03	5.421	0.000
Adaptability	0.027	0.004	0.048	7.208	0.000
Perceived interest	0.082	0.003	0.176	26.027	0.000
Expectation confirmation	0.028	0.003	0.069	10.302	0.000
Satisfaction	0.029	0.003	0.059	8.229	0.000
Learning difficulty					
Device	-0.006	0.001	-0.033	-4.847	0.000
Network	-0.004	0.001	-0.017	-3.431	0.001
Interest	-0.014	0.001	-0.067	-11.375	0.000
Concentration	-0.002	0.001	-0.012	-2.376	0.018

Note. $R=0.389$, $R^2=0.154$. Adjusted $R^2=0.154$.

Discussion

Students have relatively high adaptability and recognition to online learning, especially in terms of perceived ease of use and perceived usefulness, and over 60% of students have continuance intention to online learning. On the one hand, related to the students' experience of online learning, the findings of this study showed that more than 40% of students have previous experience of online learning, which lays a good foundation for students to quickly adapt to long-term online learning. On the other hand, it is also related to the achievements of the construction of basic education informatization in China over the past decade. Since 2010, China's education informatization has made considerable progress (Zhang & Wang, 2019). Bottom-up innovation in education informatization has become the norm, with MOOC, micro-lecture, flipped classroom, and maker-based becoming hot spots in education informatization. This trend has also enabled teachers to improve their IT application ability and realize the transformation from "knowing how to use IT" to "knowing how to use IT for teaching". To a certain extent, this ensured the smooth implementation of online teaching during the epidemic. In addition, many schools placed great emphasis on home-school cooperation (Zheng & Wan, 2020).

Teachers and parents worked closely together to support and monitor students' home learning. All of these contributed to the effect of online learning, allowing students to adapt quickly.

Students have some learning difficulties in the process of online learning, including the lack of interaction, difficulty of concentrating, and the lack of learning initiative**.** On the one hand, some difficulties are related to the characteristics of online learning. In online learning, teachers and students are relatively separated in time or space. Self-regulated learning is the main form of learning, supplemented by teachers' aid; the teaching and learning behaviours are linked through various educational technologies and media resources (Ding, 2000). Teachers and students can only communicate through online platforms, yet separated by a screen, teacher-student interactions are vulnerable to network instability. Also, many teachers lack experience and preparation for teaching online. They do not place enough emphasis on interaction or even know how to design interactive activities, which leads to a lack of student interaction with teachers.

On the other hand, students are not prepared for self-regulated learning. Primary and high school students are still young. They usually perform well under the requirements of their teachers and the supervision of their parents and are able to complete their online learning tasks well. However, when given more autonomy, they do not perform as well. For instance, they are easily distracted by their surroundings and the various messages on electronic screens in class, making it difficult to concentrate on their learning. They also lack planning and reflection on their study, resulting in less initiative in learning.

There are significant differences in online learning between students of different grades. Junior high school students performed better than primary and senior high school students, as evidenced by being relatively more engaged in online classes and self-regulated learning and having a higher recognition of online learning. The main reasons for this difference are the psychological attributes, learning characteristics, and the academic strength of different students. Compared to primary school students' strong learning dependency and unstable and unsustainable attention (C.I. Wang, 2019), high school students begin to strengthen their self-concept and form a perception of learning (X.G. Wang, 2010), and their internal motivation to learn is enhanced, making them better able to self-manage the process of online learning. With moderate academic pressure, junior high school students can accept online learning to a greater extent and experience it with an open mind, eventually gaining a higher recognition of online learning. In the case of senior high school students, although they have stronger self-regulated learning abilities, they face more learning difficulties and academic pressure. The sudden arrival of online learning broke their original study habits and plans. Their adaptability to online classes was the worst of the three grades, and their participation and performance in online courses was also weaker.

Suggestions

It is necessary to summarize the experience of online learning during COVID-19, integrate the educational resources generated in this period, and improve the resource service system for basic

education to guarantee blended learning in the post-epidemic era. Online education practices across China during COVID-19 pushed the reform of teaching modes. As a result, a new ecology of two-way integration between online education and school education is taking shape, showing a form of large-scale social collaboration (Yu et al., 2020). Every province in China developed a series of classrooms in the air to ensure the smooth development of online education, which rapidly gathered a large number of online resources. For example, the Education Bureau of Jiangsu Province organized the recording of online course resources covering 12 grades in primary and high schools; Guangxi Province developed more than 200 online free courses; and the Beijing Municipal Education Commission accumulated more than 1,000 quality courses online. How can these resources be integrated and applied to curriculum teaching after the end of the epidemic? Exploring a hybrid teaching model based on online resources should be the focus of education informatization reform.

Resources, as the core content of digital transformation in education, have become a key element in driving systemic change in education. The structural lack of resources in this epidemic period is highlighted by the low usage of existing resources by teachers (Zhao & Jiang, 2020). This is partly because the content and type of resources cannot meet individualized teaching needs. It is also because the interconnection between resource platforms at all levels is not deep enough, and there is no mechanism for sharing quality resources between localities. Therefore, on the one hand, there is a need to strengthen the construction and service capacity of high-quality resources, especially the ability training courses and cognitive tools. On the other hand, it is necessary to integrate various resource platforms at all levels and to clarify the functions of different resource platforms. For example, the national platform provides basic resources, which are mainly used to meet the basic needs of teachers and students. Enterprise platforms provide market-oriented resources to meet personalized learning needs. Also, school-level platforms self-supply school-based resources to support teachers and students in their educational activities (Ke et al., 2018).

It is important to promote reform of the classroom teaching modes and strengthen the cultivation of self-regulated learning ability for students in the class. The effects of online learning are directly related to students' self-regulated learning abilities, which is an important component of lifelong learning. This study found that students did not perform well in self-regulated learning during the epidemic, and this was one of the reasons for their poor learning outcomes. The Outline of Basic Education Curriculum Reform (for Trial Implementation) issued by China's Ministry of Education clearly states the development of students' subject consciousness and their ability to learn independently as one of the goals of the new curriculum reform. Therefore, taking advantage of online teaching, schools should integrate the cultivation of self-regulated learning abilities into their daily teaching. For example, teachers can use various tactics and tools prior to teaching the course content to help students make learning plans and rationalize their learning time. After teaching, teachers can guide students to reflect on their learning outcomes in a timely manner to develop their planning and evaluation skills. During the teaching process, teachers can utilize teaching strategies to design learning activities, provide scaffolding to motivate students to learn, lead them to think positively, enhance cooperation and express their opinions, and equip them with the right learning methods so that they can develop the ability to control and regulate their learning.

Making teachers' information literacy and online teaching skills the focus of teacher capacity enhancement in the post-epidemic era. Teachers, as the main subjects of the "suspension of school without suspending learning" practice, have experienced the change from face-to-face teaching to online teaching. It has been proven that teachers' information literacy and online teaching skills directly impact the effect of online education. The training of teaching skills in basic education has been mostly oriented towards face-to-face teaching and less towards online teaching. With the further development of education informatization, the ability to teach online will become one of the basic abilities of teachers in the "Internet+" era. To improve online teaching ability, first, teachers should focus on strengthening their understanding of the law of online teaching and mastering the capacity to choose the appropriate teaching mode according to different situations. Further, teachers should pay attention to information literacy development, be able to adapt to new technologies actively, and try to use new technologies in teaching. Finally, teachers should attach importance to improving their competence in instructional design. On the one hand, the focus of lesson preparation should be changed from studying the content to studying students' characteristics and designing teaching activities and interactions. Teachers should plan interesting activities based on the psychological and learning characteristics of students at different ages and guide them to actively participate in class. In addition, teachers should actively communicate with students after class to understand their needs and give them personalized guidance. On the other hand, teachers should shift from the traditional teaching model to a resource-based blended teaching model. Not only should face-to-face teaching be blended with online teaching but teaching and tutoring should also be combined to create a truly highly engaging and personalized learning experience for students (Feng et al., 2020).

References

Ding, X. F. (2000). A new definition of distance education, distance teaching and distance learning: Discussion on the basic concepts of distance education and open learning (3). *China Educational Technology, 7*, 47-49. https://kns.cnki.net/kcms/detail/detail.aspx?FileName=ZDJY200007024&DbName=CJFQ2000

Feng, X. Y., Wang, R. X., Cao, J. T., & Huang, L. Y. (2020). Trinity of educational supply-side reform in the era of "Internet+". *E-Education Research, 41*(4), 42-47. https://doi.org/10.13811/j.cnki.eer.2020.04.006

Ke, Q. C., Wang, P. L., & Zhang, J. Q. (2018). Supply model, classification framework and developmental strategies of digital education resources. *E-Education Research, 39*(3), 68-74. https://doi.org/10.13811/j.cnki.eer.2018.03.011

Ministry of Education of the People's Republic of China. (2001). *Notice of the Ministry of education on printing and distributing the outline of basic education curriculum reform (for Trial Implementation)*. http://www.moe.gov.cn/srcsite/A26/jcj_kcjcgh/200106/t20010608_167343.html

Wang, C. F. (2019). An analysis of the psychological characteristics of primary school students. *Proceedings of the 2019 Conference on Innovative Research on Quality Education in Primary and Middle schools*. Beijing, China: Research Center for basic education curriculum reform of the Ministry of Education, 76. https://doi.org/10.26914/c.cnkihy.2019.012722

Wang, D. D., Wang, H. B., Zhang, W., Wang, H. R., & Shen, X. P. (2020). Research on online teaching in the period of "suspending classes without stopping learning"—based on 33,240 online surveys across the country. *Modern Educational Technology*, *30*(3), 12-18. https://kns.cnki.net/kcms/detail/detail.aspx?FileName=XJJS202003003&DbName=CJFQ2020

Wang, J. X., Cui, Y. P., & Yan, Y. T. (2020). Analysis on effect and potential influencing factors of massive online education practice during the COVD-19: a case of Xiaogan, Hubei Province. *E-Education Research*, *41*(6), 5-11. https://doi.org/10.13811/j.cnki.eer.2020.06.001

Wang, X. G. (2010). Analysis and guidance on the psychological characteristics of middle school students. *New West, 2*, 183-184. https://doi.org/10.3969/j.issn.1009-8607-B.2010.02.140

Yu, S. Q., Wang, D., & Wang, Q. (2020). Reform of large-scale socialized collaborative educational services. *E- Education Research*, *41*(4), 5-12. https://doi.org/10.13811/j.cnki.eer.2020.04.001

Zhang, L. G., & Wang, W. H. (2019). Education Informatization in China: scientific connotation, stage characteristics and evolutionary logic. *Contemporary Teacher Education*, *12*(1), 30-31. https://doi.org/10.16222/j.cnki.cte.2019.01.004

Zhao, H., & Jiang, F. (2020). An analysis on new model of educational resource construction in the era of "Internet+". *E- Education Research*, *41*(7), 48-49. https://doi.org/10.13811/j.cnki.eer.2020.07.007

Zheng, X. D., & Wan, K. (2020). Implementation logic, content and suggestions of home-school partnerships in large-scale K12 online teaching. *China Educational Technology, 4*, 16-20. https://doi.org/10.3969/j.issn.1006-9860.2020.04.006

Authors

Jiaju He holds a Bachelor of Education and is a postgraduate student of Distance Education in the Faculty of Education at Beijing Normal University, China. His research interests include Internet education, lifelong learning, ICT in education, and learning analytics. He has several educational research internship experiences in educational technology companies. Email: 320000309@qq.com

Hong Zhao, Associate Professor, Master's Supervisor in the Faculty of Education at Beijing Normal University, China. She is mainly engaged in the study of online learning and cognitive development research, with a focus on the study of learners' characteristics and ability training. Email: zhaohong@bnu.edu.cn

Fei Jiang holds a Master of Education from the Faculty of Education, Beijing Normal University, China. Her research interest is teaching and learning in online education. She has published several papers related to online learning and continuing education and has participated in the editing of teaching material. Email: 739802719@qq.com